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Dated 4 November 2004

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# Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road  
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1. Your reference P38122-/MGO/JDB

2. Patent application number  
(The Patent Office will fill this part in) 16 OCT 2004 0423024.9

3. Full name, address and postcode of the or of each applicant (underline all surnames) Europlacer Industries SAS  
Route De Cholet  
85620 Rocheserviere  
France

Patents ADP number (if you know it) 08966673001

If the applicant is a corporate body, give the country/state of its incorporation France

4. Title of the invention "Apparatus and Method of Modular Belt Distribution of Stick Fed Components"

5. Name of your agent (if you have one) Murgitroyd & Company

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode) Scotland House  
165-169 Scotland Street  
Glasgow  
G5 8PL

Patents ADP number (if you know it) 00061198015

6. Priority: Complete this section if you are declaring priority from one or more earlier patent applications, filed in the last 12 months.

Country	Priority application number (if you know it)	Date of filing (day / month / year)

7. Divisionals, etc: Complete this section only if this application is a divisional application or resulted from an entitlement dispute (see note f)

Number of earlier UK application	Date of filing (day / month / year)

8. Is a Patents Form 7/77 (Statement of inventorship and of right to grant of a patent) required in support of this request?

Answer YES if:

Yes

- a) any applicant named in part 3 is not an inventor, or
- b) there is an inventor who is not named as an applicant, or
- c) any named applicant is a corporate body.

Otherwise answer NO (See note d)

## Patents Form 1/77

9. Accompanying documents: A patent application must include a description of the invention. Not counting duplicates, please enter the number of pages of each item accompanying this form:

Continuation sheets of this form	-
Description	14
Claim(s)	3
Abstract	1
Drawing(s)	3 <i>cf</i>

10. If you are also filing any of the following, state how many against each item.

Priority documents	-
Translations of priority documents	-
Statement of inventorship and right to grant of a patent (Patents Form 7/77)	-
Request for a preliminary examination and search (Patents Form 9/77)	-
Request for a substantive examination (Patents Form 10/77)	-
Any other documents (please specify)	-

11. I/We request the grant of a patent on the basis of this application.

Signature(s)

*Murphy & Company*

Date 15/10/2004

12. Name, daytime telephone number and e-mail address, if any, of person to contact in the United Kingdom

James D Brown  
01224 706616

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### Notes

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1     "Apparatus and Method of Modular Belt Distribution  
2     of Stick Fed Components"

3  
4     The present invention finds its application in the  
5     field of electronic component assembly and more  
6     particularly with pick and place machines used to  
7     mount electronic components such as integrated  
8     circuits (hereinafter referred to as "chips") or  
9     Surface Mounted Devices ("SMDs") on printed circuit  
10    boards. Moreover, it relates to the distribution of  
11    such components (which are usually packaged in  
12    sticks, generally made of plastic or metal) and a  
13    distribution device is used to feed these  
14    components, one at a time, to a head of the pick and  
15    place machine head.

16  
17    In order to distribute and present such electronic  
18    components, one at a time, to the head, several  
19    conventional systems and methods are used in the  
20    prior art. Components can be brought by gravity to  
21    the pick and place head, and this method requires an  
22    oblique/angled slope or canal that can interfere

1 with the pick and place head. When the component  
2 supply canal has to be horizontally orientated, e.g.  
3 because of congestion problems, it is possible to  
4 feed components using vibrations. However, as the  
5 feeding of components is not positive, these  
6 machines are often slow. Furthermore, vibrations  
7 are sometimes difficult to optimise because of the  
8 mass variations of the vibrating set when the  
9 component number is decreasing. In some instances,  
10 components are fed on a horizontal part of the  
11 machine by one or several belt distributors. The  
12 feeding is then more positive and the component  
13 transport is faster.

14  
15 In the belt distributors referred to above, a first  
16 arrangement consists in integrating, on a base, a  
17 single wide belt on which are generally fed several  
18 components. The problem of this configuration is  
19 that components (such as chips) resting on the belt  
20 are standing on their leads, and because of the  
21 inevitable friction, there is a high risk of  
22 damaging or contaminating them. To prevent this  
23 problem, other devices consist of providing, on the  
24 same base, several belts, each being arranged to  
25 convey a certain type of component by its body,  
26 without touching its leads. The base is thus an  
27 autonomous system which includes belts, driving  
28 motors and command systems, and such a prior art  
29 system is shown in Figure 1. The major disadvantage  
30 of these devices is that the base must be configured  
31 for one or several types of component of which the  
32 size is known in advance, making it difficult if not

1 impossible to change the configuration (i.e.  
2 position/size) of the belts on the base in order to  
3 fit components of various sizes. Accordingly, every  
4 such conventional autonomous distribution device is  
5 dedicated to one or to a combination of component  
6 types. Meanwhile, the pick and place equipment  
7 should satisfy a need of flexibility that this kind  
8 of device cannot achieve. Furthermore, when a new  
9 type of component or a new combination of components  
10 is to be implemented, this type of equipment imposes  
11 the requirement to change the whole base, meaning  
12 additional time and expense.

13

14 According to a first aspect of the present  
15 invention, there is provided a distribution system  
16 for transfer of components to a position for picking  
17 by a pick and place machine head, the distribution  
18 system according to claim 1.

19

20 According to a second aspect of the present  
21 invention, there is provided a component distributor  
22 module for use in a distribution system for the  
23 transfer of components to a position for picking by  
24 a pick and place machine head, the component  
25 distributor module according to Claim 9

26

27 According to a third aspect of the present  
28 invention, there is provided a base portion for use  
29 in a distribution system for the transfer of  
30 components to a position for picking by a pick and  
31 place machine head, the base portion according to  
32 claim 10.

1 Preferred and/or optional features of the  
2 distribution system are set out in the dependent  
3 claims.

4  
5 Preferably, the distribution system further  
6 comprises a control system and the base portion  
7 further comprises a second motive means to drive a  
8 common retractable bar which is typically provided  
9 with a spring means to assist return of the common  
10 retractable bar to a position closest to the  
11 components to be picked.

12  
13 Typically, a plurality of individual component  
14 distributor modules are provided with each module  
15 having a belt means adapted to the width of a class  
16 of components.

17  
18 Preferably, a single first motive means is provided  
19 for the base portion and which is adapted to drive  
20 each and every belt means of the respective  
21 plurality of component distributor modules via a  
22 transmission mechanism which typically ensures the  
23 synchronous rotation of the belt means for each of  
24 the distributor modules. The transmission mechanism  
25 preferably comprises a horizontally arranged geared  
26 member into which each of the component modules  
27 couples via respective geared means.

28  
29 Embodiments of the present invention have the  
30 advantage that they allow fast loading and unloading  
31 of the modular component distributor modules on a  
32 universal common base portion, by means of an

1 accurate location means at one side, and typically  
2 every component distributor module is typically at  
3 least partially provided with a notch and locating  
4 bar or the like at one side to permit an accurate  
5 location and is further typically at least partially  
6 provided with a fast fitting element.

7  
8 Embodiments of the present invention will now be  
9 described, by way of example only, with reference to  
10 the accompanying drawings, in which:-

11 Fig. 1 is a schematic end view of a component  
12 belt transfer device according to the prior  
13 art;

14 Fig. 2 is a schematic end view of an embodiment  
15 of a component distribution system according to  
16 the present invention;

17 Fig. 3 is a side view of the component  
18 distribution system of Fig. 2 showing a  
19 universal base and an individual drive module;

20 Fig. 4 is a side view of the individual drive  
21 module of Fig. 3;

22 Figs. 5 and 6 are schematic representations  
23 during the operation of picking a component  
24 from an individual detachable module of Fig. 3;  
25 and.

26 Figs. 7 and 8 are schematic representations of  
27 an individual detachable module which has not  
28 had a component picked from it.

29  
30 Fig. 1 represents a device according to the prior  
31 art for transferring electronic components 8, such  
32 as chips 8". The device of Fig. 1 comprises a base



1 6' which is an autonomous system which integrates  
2 belts 12', drive system (not shown) and the command  
3 system therefor (not shown). If another type of  
4 component 8 must be transported, it is necessary to  
5 change the base 6'.

6 "

7 Fig. 2 illustrates an end view of a system according  
8 to the present invention which includes a universal  
9 common base 6 and component 8 belt distribution  
10 modules 1 (also hereinafter referred to as lane 1).  
11 The distribution modules 1 are independent from one  
12 another and are detachable from the universal common  
13 base 6. A common motor 4 associated with the  
14 universal base 6 drives a common interface  
15 mechanism, which in Fig. 3 is depicted as a gear  
16 shaft 3 driving the belts 12 through geared wheels  
17 14 arranged on each module 1.

18

19 Fig. 3 illustrates the embodiment of the present  
20 invention as comprising the universal base 6 and the  
21 individual distribution module 1. The  
22 aforementioned module 1 is detachable from the base  
23 6 and moreover can be quickly secured to and  
24 detached from the base 6 by operation of releasable  
25 fixing means or fitment means, which are shown in  
26 Fig. 3 as being in the form of a notch which acts as  
27 a front stop 10 and a rear fitting clip 2.

28

29 A retractable stop 9 integrated into the common base  
30 6 assists an individually fed component 8 to be  
31 picked up by the pick and place head (not shown) at  
32 the end of the transfer belt 12. This stop 9 is

1 activated by an electromagnet 7 and it is adjustable  
2 according to the length of the component 8 in order  
3 to feed only one component 8 to the correct position  
4 to be picked up by the pick and place head. This  
5 stop 9 is retractable in order to avoid any pressure  
6 being exerted on the component 8 while the machine  
7 head (not shown) picks it up.

8  
9 Fig. 4 shows an individual distribution module 1  
10 according to the invention. Every individual  
11 distribution module 1 is autonomous and includes a  
12 belt 12 for transporting components 8. This belt 12  
13 is guided by bearings 15 having smooth outer  
14 circumferences. The belt 12 is driven by the geared  
15 wheel 14 which in turn is driven by the gear shaft 3  
16 located on the universal base 6. The slope 11 is  
17 used as a component reservoir and as a stick guide.  
18 The location of the distribution module 1 on the  
19 universal base 6 is achieved by the notch or groove  
20 10 located at the front of the distribution module 1  
21 locating around a roller 34 provided on the  
22 universal base 6. The rear end of the distribution  
23 module 1 is then lowered onto the universal base 6  
24 and a downwardly projecting pin 13 located at the  
25 back of the module 1 locates in a hole (not shown)  
26 provided in the upper surface of the universal  
27 common base 6.

28  
29 The size of every individual distribution module 1,  
30 and more particularly, the width of the belt 12 for  
31 each individual distribution module 1, depends on  
32 the component 8 to be brought to the machine head.

1 Accordingly, the width of the belt 12 for each  
2 individual distribution module 1 is chosen such that  
3 it is approximately equal to the width of the body  
4 of the components 8 such that when a component 8 is  
5 placed on the belt 8, it will lie on top of the belt  
6 12 on its underside or belly, with the component's  
7 legs being situated laterally of the belt 12 such  
8 that the legs of the components 8 straddle and hang  
9 down from the belt 12.

10

11 The interaction between the components 8, 8' and the  
12 movement of the belt 12 and retractable stop 9 is  
13 shown in Figs. 5 to 8.

14

15 The components 8 are initially contained in a stack  
16 within a tube (not shown) which is placed on the  
17 angled slope 11 in the correct orientation so that  
18 the components 8 are fed onto the slope 11 end of  
19 the belt 12 in the correct orientation. The  
20 components 8 are thus sitting on top of the belt 12  
21 with their legs straddling the belt 12 and when the  
22 belt moves in the direction of arrow 22 in Fig. 5  
23 (the upper portion of the belt moving from right to  
24 left toward the picking location in Fig. 5), the  
25 components 8' pass underneath upper guide path 20.  
26 Fig. 5 is a schematic diagram showing one belt 12  
27 after the components 8, 8' have been pushed right to  
28 left by the belt 12. The friction created between  
29 the belt 12 and the components 8, 8' generates a log  
30 jam or a compression between the components 8, 8',  
31 and as shown in Fig. 5, the components 8, 8' will  
32 tend to fill the gap between the upper surface of

1 the belt 12 and lower surface of the upper guide  
2 path 20, since the retractable stop 9 as shown in  
3 Fig. 5 is preventing any further right to left  
4 travel in the direction of arrow 22 of the left hand  
5 most component 8. Accordingly, the force acting  
6 upon component 8 in Fig. 5 by the following  
7 components 8' is shown as arrow 18. Accordingly, if  
8 a pick and place head were to try and pick the  
9 component 8 up by means of a conventional vacuum  
10 nozzle suction action, if the force 18 is too high,  
11 the picking action may fail since the component 8 is  
12 effectively locked in position between the  
13 retractable stop 9 and the following components 8'.  
14

15 To avoid the potential failure of the picking  
16 action, the belt 12 is stopped momentarily and the  
17 stop 9 is retracted or moved from right to left as  
18 shown in Fig. 6, and in so doing, creates a gap  
19 between it 9 and the component 8 to be picked which  
20 therefore releases the pressure on the component 8.  
21

22 As can be seen in Fig. 6, the upper guide path 20 is  
23 arranged to only extend as far as the left hand most  
24 component 8', such that the upper guide path 20 will  
25 not interfere in the picking action of the component  
26 8. Accordingly, the pick and place head can now be  
27 moved into position above the component 8 and when  
28 its suction action is activated, can pick the  
29 component 8 in an upwards direction.  
30

31 If only one individual detachable distribution  
32 module 1 is in use, the components 8' sitting on

1 that belt 12 can then be advanced from right to left  
2 to the position shown in Fig. 5 and the above noted  
3 steps set out for Figs. 5 and 6 can then be  
4 repeated.

5

6 However, where more than one individual detachable  
7 distribution module 1 is located on the universal  
8 common base 6, as shown in Fig. 2, further steps set  
9 out below in Figs. 7 and 8 are desirable.

10

11 Figs. 7 and 8 show non-used lanes and as the reader  
12 will appreciate, all of the belts 12 of all of the  
13 individual detachable distribution modules 1 are  
14 moved simultaneously due to the common motor 4.  
15 Accordingly, in Fig. 7, the component 8 has not been  
16 picked. However, at this point it is desirable to  
17 reverse the belt 12, that is from left to right as  
18 shown by arrow 24 in Fig. 7. The reason for this  
19 reverse movement of the belt 12 is because all of  
20 the retractable stops 9 of all of the individual  
21 detachable distribution modules 1 are coupled to the  
22 single electromagnet 7. Therefore, if the  
23 retractable stop 9 were moved back to the position  
24 shown in Fig. 5 in a lane 1 where the component 8  
25 had not been picked (as for example in Fig. 7) there  
26 is a risk that the retractable stop 9 will hit or  
27 collide with the unpicked component 8 with the risk  
28 of it jumping off the belt 12. Accordingly, for  
29 this reason, the belt 12 is driven backwards (i.e.  
30 in the direction of arrow 24 in Figs. 7 and 8) to  
31 move the unpicked component 8 further away from the  
32 retractable stop 9, typically by about 1 to 2 mm.

1

2 The retractable stop 9 is then moved in the  
3 direction of the arrow shown in Fig. 8 (i.e. from  
4 left to right) toward the unpicked component 8, but  
5 without any risk of immediately touching the  
6 unpicked component 8.

7

8 The detachable distribution modules 1 are then ready  
9 for a new cycle of steps starting from Fig. 5 and  
10 thus all the belts 12 can be moved again in the  
11 direction of arrow 22. Of course, the unpicked  
12 components 8 on the non-used lanes of Figs. 7 and 8  
13 will arrive very quickly at the stop 9. However,  
14 because the body of conventional chips or surface  
15 mounted devices (SMD's) 8 can slip on the belt 12,  
16 the configuration of the components 8' in Fig. 6  
17 does not stop or otherwise jam the belt 12.  
18 Accordingly, the substantial lack of friction  
19 between the underside or belly of the components 8  
20 and the belt 12 reiterates the importance that the  
21 fragile leads of the components 8 must not lay on  
22 the belts 12.

23

24 It should be noted that the individual retractable  
25 stops 9 are mounted on a common bar 28 on the  
26 universal common base 6, wherein the individual  
27 retractable stops 9 can be individually configured  
28 by individually moving them either closer to their  
29 respective detachable distribution modules 1 or  
30 further away from the respective detachable  
31 distribution modules 1 by means of tightening/

1 loosening fastening means 26 such as screws or the  
2 like, such that the retractable stops 9 for each of  
3 the individual detachable distribution modules 1 can  
4 be adjusted depending upon the exact length of the  
5 component 8 requiring to be picked.

6  
7 A control module 30 is provided at the front or user  
8 end of the universal common base 6 which includes a  
9 microprocessor on an electronic board (not shown),  
10 the internal memory of which provides the  
11 possibility to "instruct" the individual detachable  
12 distribution modules 1 as to the nature and  
13 reference of the components 8, 8' being supplied to  
14 it. Furthermore, the microprocessor in the control  
15 module 30 can count the number of components 8, 8'  
16 to be picked and the internal memory of which can be  
17 uploaded by connecting it to a micro terminal which  
18 is able to read barcodes attached to the side of the  
19 tube or stick of components 8, 8'. Furthermore, the  
20 control module 30 is connected to the pick and place  
21 machine by means of an electrical bus (not shown)  
22 and information can be exchanged between the control  
23 module 30 and the pick and place machine in both  
24 directions. As seen in Fig. 2, the individual  
25 distribution modules 1 can be placed at any location  
26 along the width of the universal common base 6 and a  
27 transmitter on the individual detachable  
28 distribution modules 1 can be detected by a receiver  
29 connected to the pick and place head of the pick and  
30 place machine in order to provide the location of  
31 the individual detachable distribution module 1  
32 across the width of the universal common base 6.

1 Furthermore, if a lane or individual detachable  
2 distribution module 1 has run out of components 8 or  
3 if the picking of a component has failed several  
4 times, an LED is lit on the front panel 31 of the  
5 control module 30. Furthermore, a button 32 is  
6 provided on each front panel 31 of the control  
7 module for each lane 1 where the button 32 is wired  
8 into the control module 30 such that after a lane 1  
9 has been filled with components, the operator can  
10 press the button to re-activate the lane 1 and  
11 switch off the lit LED.

12  
13 It should be noted that the components 8 do not need  
14 to be supplied to the angled slope 11 in plastic  
15 tubes or the like but could be supplied directly  
16 onto the belt 12 or the angled slope 11 by means of  
17 reeled tapes (not shown) of components 8 or the  
18 like.

19  
20 Accordingly, embodiments of the present invention  
21 provide the advantage that they overcome the  
22 apparently contradictory objectives of lesser  
23 capital cost and greater flexibility.  
24 Conventionally, when the goal has been to introduce  
25 some flexibility into production systems, the  
26 capital cost increases. Alternatively, when the  
27 goal has been to decrease the capital cost of  
28 investment it is to the detriment of the flexibility  
29 of production. In contrast, embodiments of the  
30 present invention provide the advantage in  
31 dissociating the functions and in handling in a  
32 different way the common functions and the specific



1 functions. In this way, the common functions will  
2 only require to be invested once in terms of the  
3 universal common base 6 and the specific functions  
4 can be used in a flexible way in terms of the  
5 individual distribution modules 1. Furthermore,  
6 embodiments of the present invention provide the  
7 advantage that they may be easily configurable  
8 according to the production requirements.

9  
10 Modifications and improvements may be made to the  
11 embodiments hereinbefore described without departing  
12 from the scope of the invention.

## 1 CLAIMS

2

3 1) A distribution system (1, 6) for transfer of  
4 components (8) to a position for picking by a pick  
5 and place machine head, the distribution system (1,  
6 6) comprising:-

7 at least one component distributor module (1)  
8 comprising a belt member (12) adapted to the width  
9 of the component (8) to be transferred; and

10 a base portion (6) comprising a motive means  
11 (4) adapted to drive a belt member (12) of the at  
12 least one component distributor module (1);

13 characterised in that the at least one  
14 component distributor module (1) is adapted to be  
15 releasably fixed to the base portion (6).

16

17 2) The distribution system of claim 1, further  
18 comprising releasable fixing means (34, 10; 13; 2)  
19 arranged to act between the base portion (6) and the  
20 at least one component distributor module (1).

21

22 3) The distribution system of claim 2, wherein the  
23 releasable fixing means comprises a male member (34;  
24 13) provided on one of the base portion (6) and the  
25 at least one component distributor module (1), and a  
26 female member (10) provided on the other of the base  
27 portion (6) and the at least one component  
28 distributor module (1), and a releasable locking  
29 member (2) arranged to prevent the male (34; 13) and  
30 female (10) members from disengaging from one  
31 another when locked, and further arranged to permit  
32 the female (10) and male (34; 13) members to engage/

1 disengage one another when unlocked.

2

3 4) The distribution system of claim 3, wherein the  
4 male (34) and female (10) member are provided at one  
5 side of the said one of the base portion (6) and the  
6 at least one component distributor module (1), and  
7 the releasable locking member (2) is provided at the  
8 other side of the said one of the base portion (6)  
9 and the at least one component distributor module  
10 (1).

11

12 5) The distribution system of either of claims 3  
13 or 4, wherein the male member (34; 13) comprises a  
14 protruding member (34; 13) and the female member  
15 (10) comprises a groove or the like (10), the  
16 protruding member (34; 13) and groove (10) arranged  
17 to provide a close fit with one another.

18

19 6) The distribution system of any of claims 3 to  
20 5, wherein the releasable locking member comprises a  
21 clip means (2) provided on one of the base portion  
22 (6) and the at least one component distributor  
23 module (1), wherein the clip means (2) can be  
24 releasably secured to the said one (6; 1) whilst  
25 securely trapping a portion of the other of the base  
26 portion (6) and the component distributor module  
27 (1).

28

29 7) The distribution system of any preceding claim,  
30 characterized by the transfer of the component (8)  
31 by the belt (12) to a location in which the  
32 component (8) is held from further movement by a

1 retractible member (9) until the component (8) is  
2 picked by the pick and place head.

3

4 8) The distribution system of claim 7, wherein the  
5 retractible member (9) is provided on the base  
6 portion (6) and driven by a second motive means (7)  
7 provided on the base portion (6).

8

9 9) A component distributor module (1) for use in a  
10 distribution system (1, 6) for the transfer of  
11 components (8) to a position for picking by a pick  
12 and place machine head, the component distributor  
13 module (1) comprising:-

14 a belt member (12) adapted to the width of the  
15 component (8) to be transferred;

16 and releasable fixing means (10; 13; 2) to  
17 permit the component distributor module (1) to be  
18 releasably secured to a base portion (6).

19

20 10) A base portion (6) for use in a distribution  
21 system (1, 6) for the transfer of components (8) to  
22 a position for picking by a pick and place machine  
23 head, the base portion (1) comprising:-

24 a motive means (4) adapted to drive a belt  
25 member (12) of at least one component distributor  
26 module (1); and

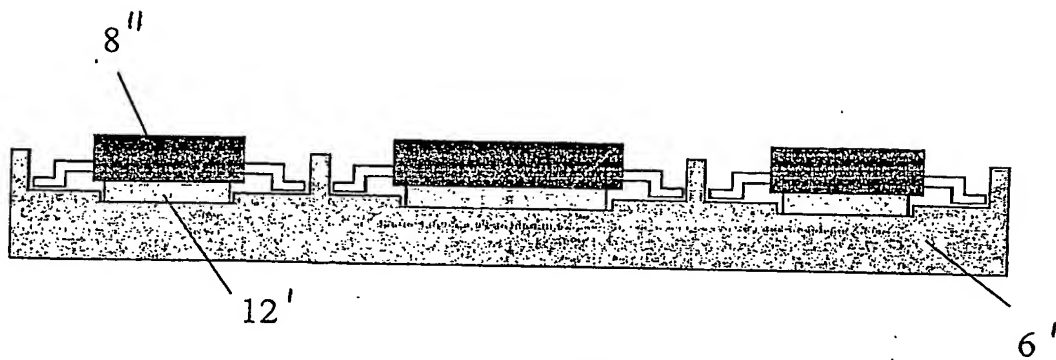
27 releasable fixing means (34 ; 2) to permit one  
28 or more component distributor modules (1) to be  
29 releasably secured to the base portion (6).

## 1 ABSTRACT

2  
3 MODULAR DEVICE FOR BELT DISTRIBUTION  
4 OF SURFACE MOUNTED COMPONENTS  
5

6 A distribution system (1, 6) of stick fed components  
7 (8) by transfer belts (12) to deliver the components  
8 (8) to a location in which they can be picked by a  
9 pick and place machine head. The system includes a  
10 universal base portion (6) which preferably  
11 integrates a common motor (4) and an interface  
12 gearing system (3) which can drive belts (12) of one  
13 or more independent and detachable distributor  
14 modules (1). One or more independent and detachable  
15 distributor modules (1), with belts (12) adapted to  
16 the component width, are releasably but securely  
17 fixed to the universal base (6) according to the  
18 surface mounted device production requirements.

PL 1/3



PRIOR ART

Fig 1

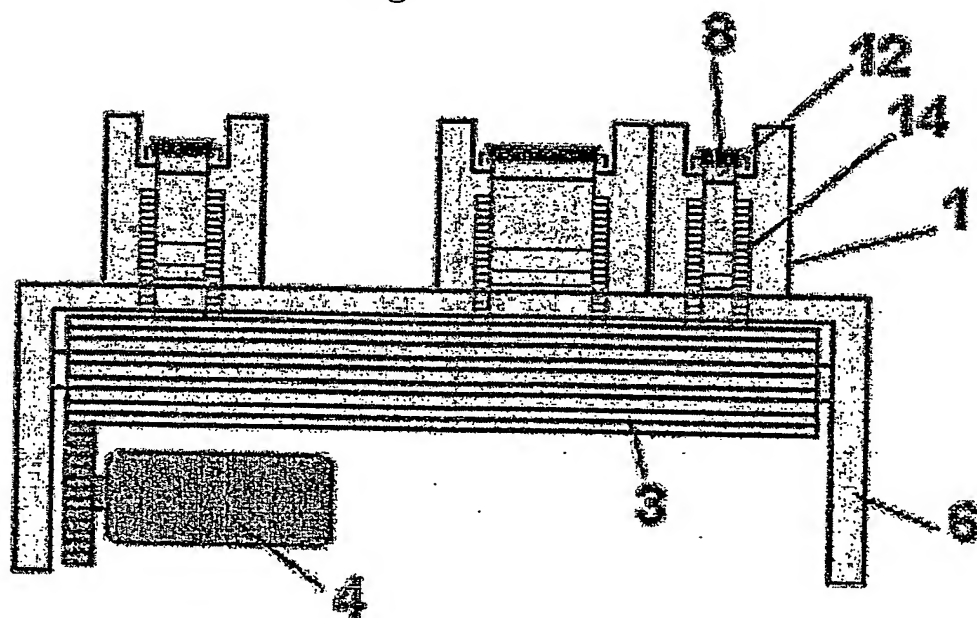


Fig 2

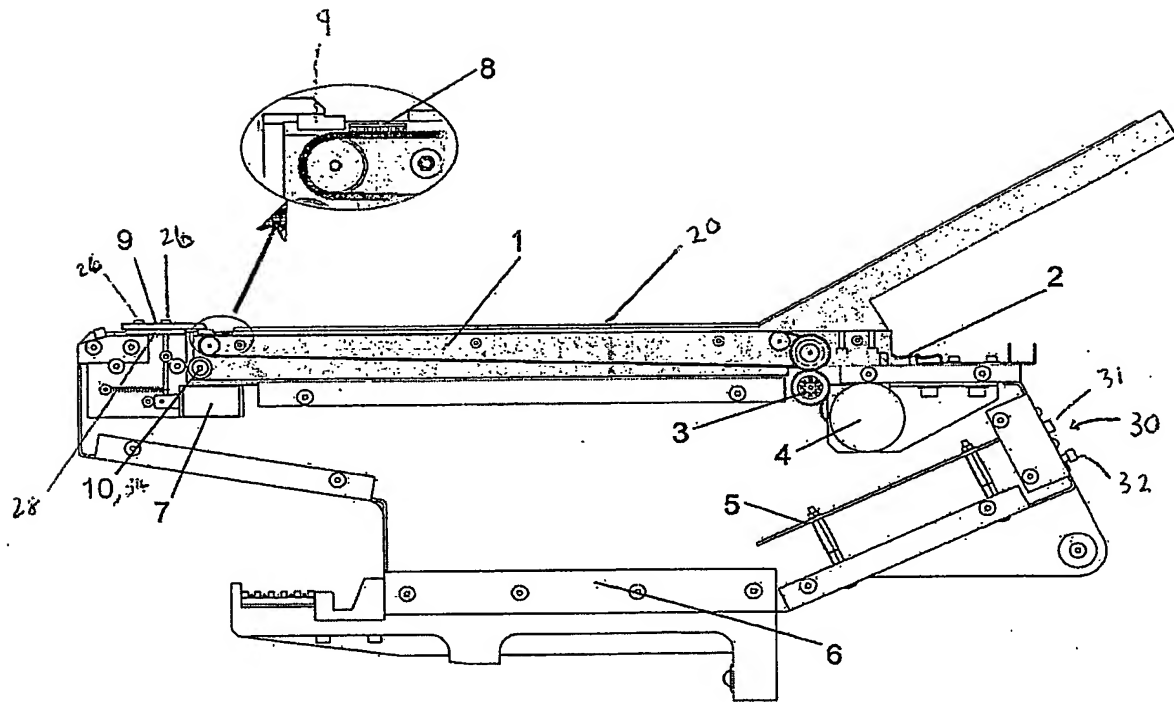


Fig 3

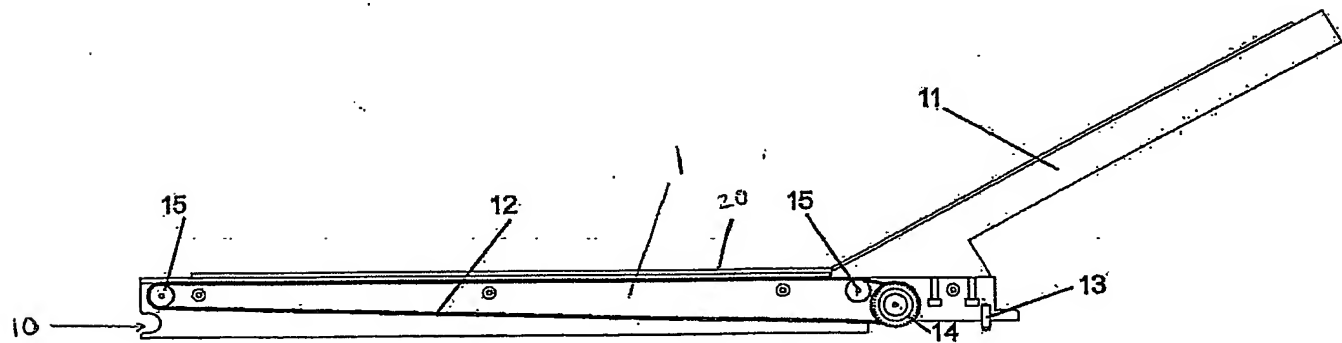
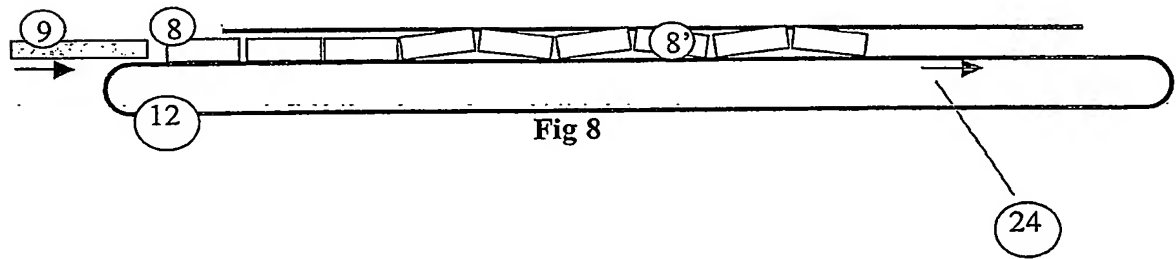
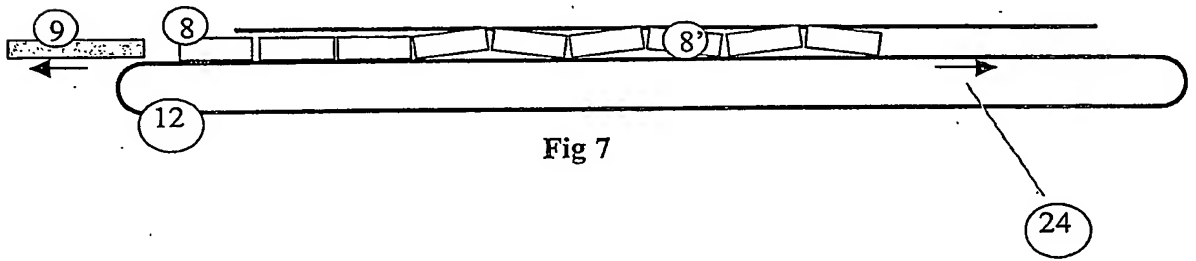
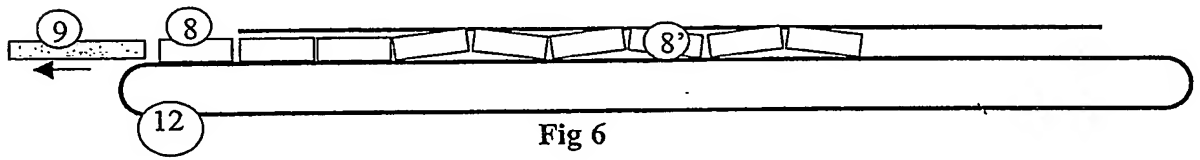
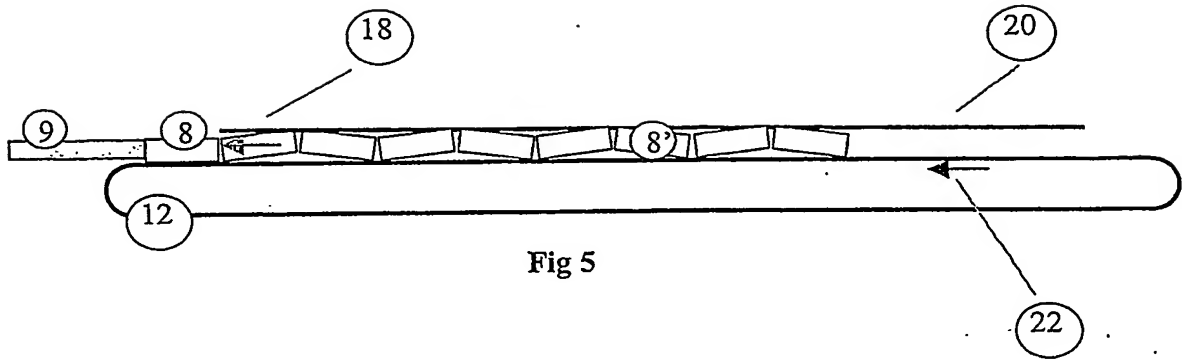


Fig 4





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